617-CD-002-001

EOSDIS Core System Project

Release B Logistics Support Analysis Plan for the ECS Project

October 1995

Hughes Information Technology Corporation
Upper Marlboro, Maryland

Release B Logistics Support Analysis Plan for the ECS Project

October 1995

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APPROVED BY

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Preface

This document, intended as a final submittal, is a contract deliverable with an approval code of 3. This document is delivered to NASA for information only, but is subject to approval as meeting contractual requirements.

Any questions should be addressed to:

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Abstract

This Logistics Support Analysis Plan (DID 617/OP3) is an update to, but does not supersede, the December 1994 plan. It addresses the management and implementation of the LSA program throughout the ECS design and operations phases of Release B. It also addresses the degree and timing of LSA activities and resources to ensure that supportability issues are considered in the design.

***Keywords**: logistics, integration, maintenance, installation, planning, supportability, requirements, verification, life cycle, release.*

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iii through x	Final
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1. Introduction

1.1 Identification

This Logistics Support Analysis (LSA) Plan, Contract Data Requirement List (CDRL) Item 123, whose requirements are specified in Data Item Description (DID) 617/OP3, is a required deliverable under the Earth Observing system (EOS) and Data and Information Systems (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.2 Purpose

This plan implements the LSA requirements of the ECS Statement of Work (SOW) and NASA's ECS Integrated Logistics Support (ILS) Plan. Its purpose is to describe the approach that will be taken by the ECS contractor for conducting logistics support analysis activities necessary to accomplish the following:

a. Cause supportability requirements to be an integral part of the ECS requirements and design

b. Define support requirements that are optimally related to the design and to each other

c. Define the support required during the operational phase

d. Prepare related logistics data products

This document describes the ECS contractor team's LSA approach to identifying ECS logistics requirements and to planning system logistics support. This plan is a tailored application of Task 102, MIL-STD-1388-1A, and is provided in accordance with CDRL 123 and the ECS SOW. It identifies the requirements and processes for conducting logistics support analyses. This plan, the ECS ILS Plan, the Integrated Support Plan (ISP), and MIL-STD-1388-1A are the guidance documents for the conduct of LSA tasks.

1.3 Scope

This plan addresses the management and implementation of the LSA program throughout the ECS design and operations phases of Release B. LSA activities will be restricted to analyses of support considerations that have an impact upon the ECS cost, performance, and operations. The LSA program is structured to support accomplishment of ECS Release B performance and support objectives at the least life cycle cost (LCC) throughout the ECS Project. This plan addresses the degree and timing of LSA activities and resources to ensure that supportability issues are considered in the design. It also addresses the continuing analysis of support performance during ECS operations to modify the logistics support where necessary to improve performance or to reduce support costs.

1.4 Status and Schedule

Updates to this plan may be required for unplanned changes in scope of the LSA program. Reissues of and changes to this plan will be provided in accordance with the requirements of the ECS Data Management Plan (CDRL 002). New submittals of this DID will be provided two weeks prior to the Incremental Design Reviews (IDRs) to be held for releases C and D.

1.5 Document Organization

The contents of the document are as follows:

Section 1: Introduction - Introduces the LSA Plan scope, purpose, status and schedule, and document organization

Section 2: Related Documentation - Describes the parent, reference, and applicable documents useful in understanding the details of subjects discussed in this document.

Section 3: LSA Process - Describes the two phases of the LSA process: analysis of supportability and verification of supportability.

Section 4: LSA Program - Describes the LSA objectives and program organization.

Section 5: LSA Schedule - Provides the delivery dates required for output products of the LSA analyses.

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which the scope and content of this document derive:

194-102-MG1-001	Configuration Management Plan for the ECS Project
420-05-03	Goddard Space Flight Center, Earth Observing System (EOS) Performance Assurance Requirements for the EOSDIS Core System (ECS)
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the EOSDIS Core System (ECS)

2.2 Reference Documents

The following documents provide guidance in the execution of the ECS contract but are not contractually binding:

616-CD-002-001	Release A and FOS Release B Integrated Logistics Support Plan for the ECS Project
500-TIP-2110	Goddard Space Flight Center Mission Operations and Data Systems Directorate (MO&DSD) Technical Information Program (TIP) Specification for Document Formats
STDN 402	Goddard Space Flight Center, System Maintenance Program
MIL STD 1388-1A	Military Standard: Logistics Support Analysis

2.3 Applicable Documents

The following documents are referenced herein and, amplify or clarify the information presented in this document. These documents are not binding on the content of this Logistics Support Analysis Plan.

102-CD-002-001	M&O Configuration Management Plan for the ECS Project
194-201 SE-001	Systems Engineering Plan for the ECS Project
194-207-SE1-001	System Design Specification for the ECS Project

302-CD-002-001	SDPS/CSMS Release A and FOS Release A and B Facilities Plan for the ECS Project
101-303-DV1-001	Individual Facility Requirements for the ECS Project
194-501-PA1-001	Performance Assurance Implementation Plan for the ECS Project
515-CD-002-001	Release B Availability Models/Predictions for the ECS Project
516-CD-002-001	Release B Reliability Predictions for the ECS Project
601-CD-001-004	Maintenance and Operations Management Plan for the ECS Project
194-602-OP1-001	Property Management Plan for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1 - ECS Overview
608-CD-001-002	ECS Operations Plan for Release B
613-CD-002-001	Release A COTS Maintenance Plan for the ECS Project
622-CD-002-001	Release B Training Plan for the ECS Project

3. LSA Process

3.1 Overview

LSA is an integral part of the ECS systems engineering and design process. Quantitative and qualitative results from trade studies are used during the ECS design phase to ensure the ECS is supportable; achieve operational availability objectives; and minimize system life cycle costs. LSA will use a common database to ensure consistency with results from other engineering disciplines (i.e., RMA, and LCC analysis). LSA will compare evolving design configurations and support issues to identify support requirements and to develop a supportable ECS system.

Release B equipment quantities will represent a substantial part of that planned for the end ECS configuration. It consists of equipment and software required to enhance the functionality at four of the eight ECS sites (i.e. Goddard Space Flight Center (GSFC), Langley Research Center (LaRC), the EROS Data Center (EDC), and Marshall Space Flight Center (MSFC), and provide the initial functionality for the remaining ECS sites (i.e Jet Propulsion Lab (JPL), National Snow and Ice Data Center (NSIDC), Alaska SAR Facility (ASF), and Oak Ridge National Lab (ORNL). The equipment and support requirements for this release are considerable. Therefore, the support analysis will address the additional equipment for this release and the planned increases in support requirements and infrastructure required for subsequent releases.

3.2 LSA Process

LSA is an iterative and multi-disciplinary process. The process consists of two phases: analysis of supportability and verification of supportability. The iterative nature of this process and the input-output relationship of the interfaces change with the phases in the system life cycle.

During supportability analysis, LSA commences at the system level to influence design and operational concepts; identify gross logistic support resource requirements of alternative concepts; and to relate design, operational, and supportability characteristics to system availability goals. The system level analysis is characterized by studies, comparative analysis and cost/performance driver identification, and tradeoffs between support, operational, and design concepts (such as self maintenance versus subcontractor maintenance support).

Once system tradeoffs are made, the analysis shifts to lower system indentures and toward support system optimization within the framework established by the system level analysis. This analysis defines the logistic support resource requirements through an integrated analysis of operator and maintenance functions to determine frequencies, times, personnel and skill requirements, and supply support requirements to include all elements of ILS. Optimization is achieved through allocation of tasks to specific maintenance levels, repair-versus-discard analysis, providing design recommendations to optimize system availability, and identification of logistic support resource requirements.

Data from the LSA process are used to develop ILS data products, such as provisioning lists, staffing and training requirements, maintenance and support equipment lists, and technical manuals. This phase of the LSA process ensures compatibility between ILS functions and permits common use of data which apply to more than one logistics element.

The second phase of the LSA process, assessment and verification, is conducted following system implementation to assess the validity of prior analyses and to adjust the support concepts, as required. This phase starts at equipment acquisition and installation and continues throughout system operations and includes assessment and verification of support operations.

3.3 LSA Tasks

The ECS LSA Program is a tailored application of MIL-STD-1388-1A. LSA tasks to be performed include the following:

a. Task 202: Mission Hardware, Software, and Support System Standardization

   Within this task support resource requirements and existing resources available to support the ECS are identified. Requirements remaining are new resources to be acquired. New resources will be standardized with particular attention paid to cost and performance drivers. Non-quantifiable risks (resource availability, technology obsolescence, facility adequacy, operations environment, and personnel availability) are identified as part of the support analysis.

b. Task 205: Supportability and Support-Related Design Factors

   This task identifies supportability characteristics, reliability and maintainability parameters, and operations and support costs. The design factors will include equipment reliability, maintainability, work force requirements, standardization, and costs. These factors are provided to the system designers as logistics design constraints.

c. Task 301: Functional Requirements Identification

   This task identifies equipment functions and assesses operations, maintenance, and support tasks required to be performed. Equipment level of repair analysis (LORA) and information from the failure modes and effects analysis (FMEA) is used to assess support tasks. Supportability risks associated with the equipment and related support are assessed.

d. Task 302: Support System Alternatives

   Using outputs of Tasks 205 and 301, the system-level alternative support concepts are developed to determine operations, support, and cost risks associated with the support concepts.

e. Task 303: Evaluation of Alternatives and Tradeoff Analysis

   This task evaluates alternative support concepts under consideration. Alternative diagnostic concepts are evaluated to determine the diagnostics equipment and/or software to be procured to support the equipment. Evaluations and tradeoffs are

conducted between design, operations, training, and personnel job design to determine the optimum solution for attaining and maintaining the required proficiency of operations and support personnel. The sensitivity of system readiness parameters to variations in key support parameters, such as R&M, spares, resupply time, manpower and personnel skill availability, are evaluated.

f. Task 401: Task Analysis

Task 401 is accomplished using inputs from prior tasks. The operations and maintenance tasks previously identified are analyzed to determine the types and quantities of resources required. Risks previously identified are analyzed to determine those that have been eliminated and to make known to the system designers those risks that remain.

g. Task 403: Post-Production Analysis

Task 403 identifies logistics resources that may not be available throughout the life of the ECS project. Replacement/alternative sources of support items that represent significant potential risk are identified.

h. Task 501: Supportability, Test, Evaluation, and Verification

Task 501 is performed to verify that system supportability requirements are being met. Where supportability deficiencies exist, the needed corrective actions are identified and addressed. Previous corrective actions are assessed to ensure their adequacy in resolving the discrepancy.

The logical flow of LSA tasks is depicted in Figure 3-1, “LSA Task Flow.”

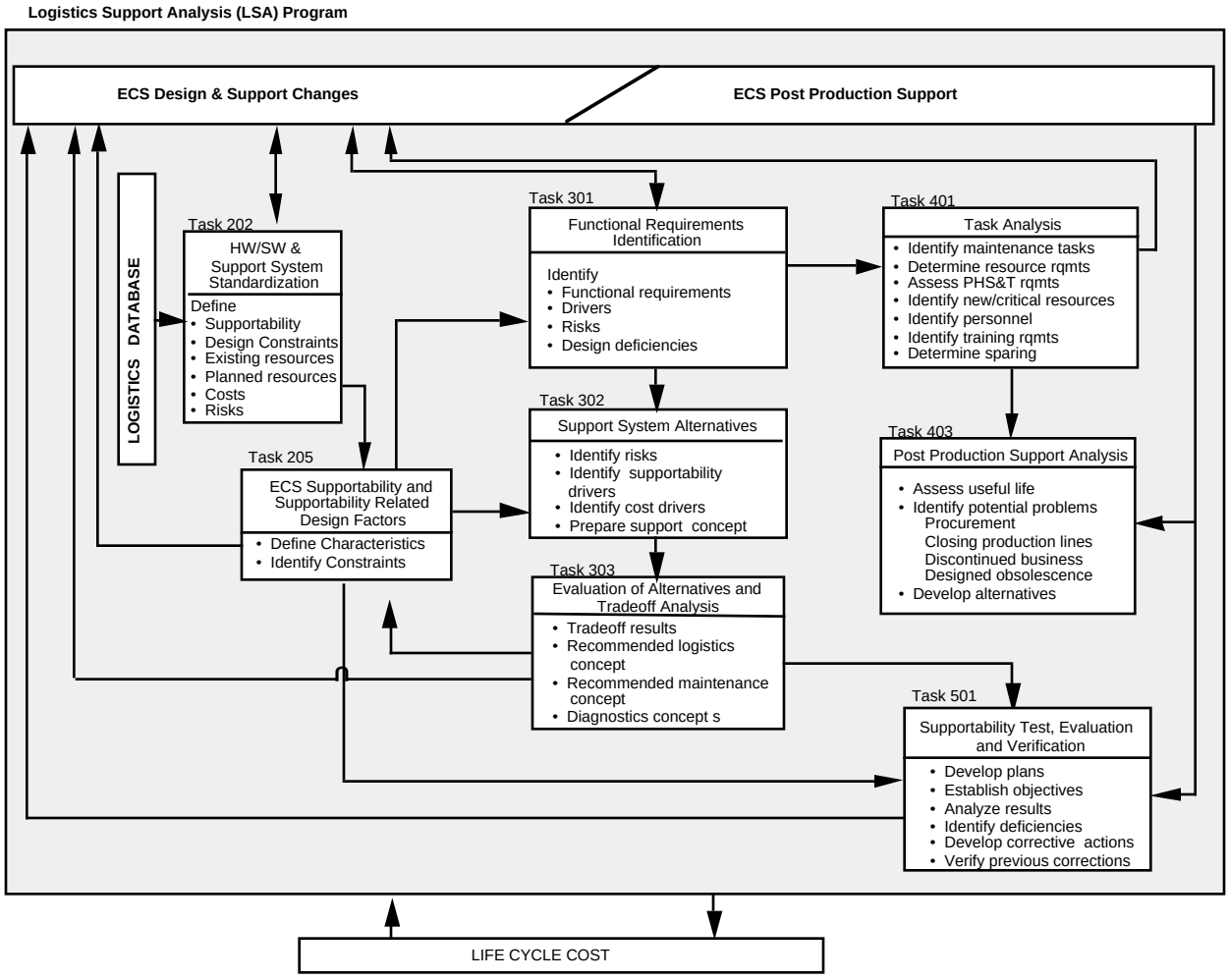

Figure 3-1. LSA Process Flow

The relationship of LSA activities to the follow-on logistics planning and deliverables is shown at Figure 3-2, “LSA Relationship to Logistics Planning.”

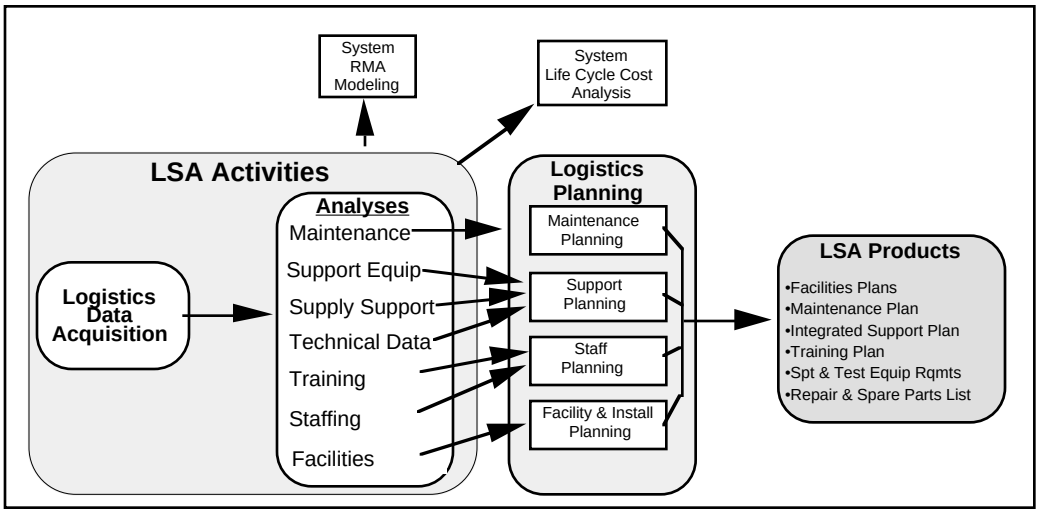

Figure 3-2. LSA Relationship to Logistics Planning

3.4 Selection of LSA Candidates

Final selection of equipment for logistics support analysis is made upon receipt of the logical design at completion of the SCDO Release B IDR . A preliminary selection was made based upon current knowledge of what that design will include. That selection includes the following: Science processors, computer workstations and servers, communications equipment (e.g., FDDI switches, concentrators), and data storage devices. These were selected for analysis because they will have the greatest influence on system operational performance, life cycle costs, and logistics supportability. LSA analyses will be based on the aggregate ECS quantities to be supported during Release B and a projection of the equipment that must be supported during subsequent releases. Government equipment planned for use with Release B will be included in logistics support analyses. In such cases, logistics data will be requested from the Government, verified, and used to complete the analysis.

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4. LSA Program

4.1 LSA Objectives

The goal of LSA is to provide the analyses and information needed to develop and implement a supportable ECS system at the lowest life cycle cost. LSA objectives for achieving this goal include the following:

a. Establish supportability objectives and supportability related design goals, thresholds, and constraints through analyses of supportability, cost, and readiness drivers

b. Optimize the ECS support concept and develop an ECS that achieves the best balance between cost, schedule, performance, and supportability

c. Identify the logistic support resource requirements and develop plans for operations support

d. Ensure that ECS operations and support requirements are achieved and refine ECS support for an optimal balance between performance and costs

LSA activities provide engineering and operations offices the information they require to make informed decisions relative to ECS design and supportability issues. These activities include the following:

a. Determining the ECS equipment to be supported

b. Identifying the support factors required to achieve operations objectives

c. Integrating logistics support considerations into the systems design process

d. Providing interfaces between the engineering, design, and support planning activities

e. Providing an interface with RMA and life cycle cost (LCC) functions

f. Defining ECS supportability requirements

g. Monitoring system maintainability, availability, and logistics support performance

The LSA process used in performing these activities will be iterative as the ECS matures through each release and operations. The LSA program is designed to provide the level of analysis required to identify support resource requirements sufficiently early in the program to ensure that support performance and cost drivers are considered in the system engineering and design processes.

4.2 LSA Program Organization

The ILS Office is responsible for the LSA program in support of ECS Maintenance and Operations (M&O) Office, the Science and Communications Development Office (SCDO), Flight Operations Segment (FOS), and the System Management Office (SMO). The ILS Manager

maintains the logistics interface between the ECS elements and the NASA ECS Project Office. Figure 4-1, "ILS Organization," depicts the organization for managing the ILS program and its component LSA activities. Internal interfaces with ECS design groups, SMO, and the ILS Office are established.

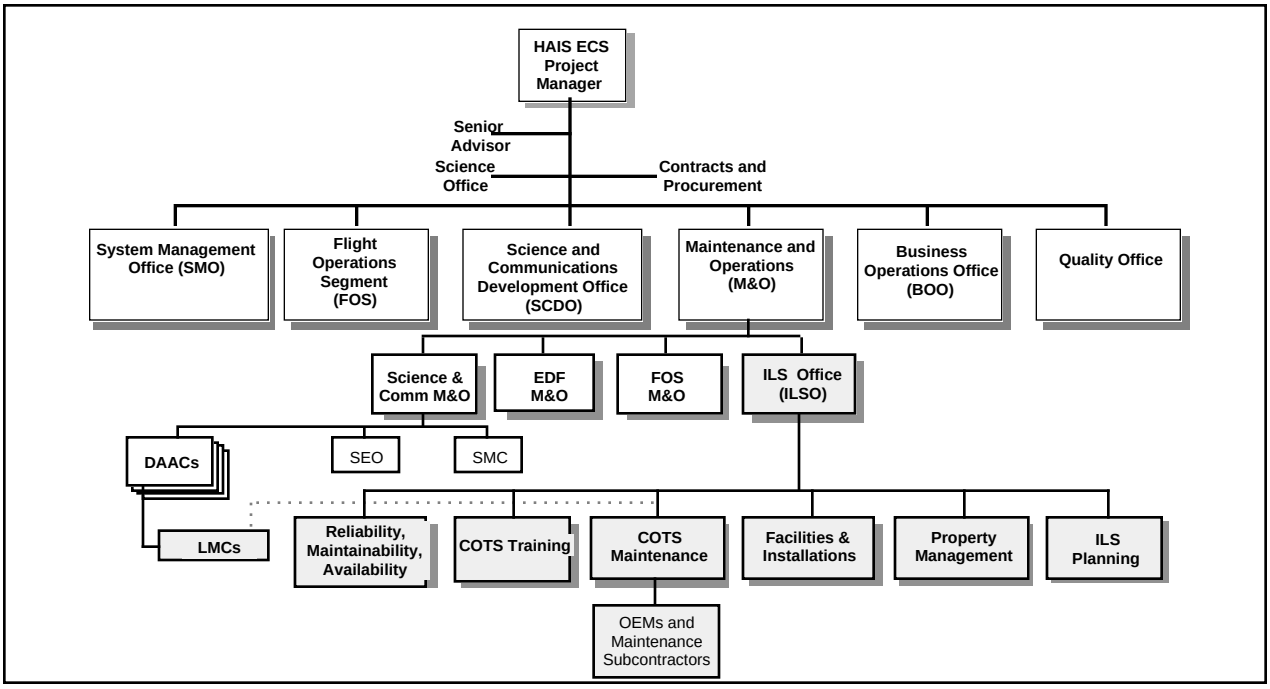

Figure 4-1. Logistics Organization

4.3 LSA Interfaces

The LSA Program interfaces directly with systems engineering, the RMA program, and ECS life cycle cost (LCC) modeling.

4.3.1 Internal Interfaces

LSA influences the ECS engineering and design functions through supportability analyses and tradeoff studies of alternative design and support approaches. Logistics supportability and supportability related design requirements enter the systems engineering process as shown in Figure 4-2, "LSA Interfaces with System Engineering." Implementation actions are the joint responsibility of systems engineering and ILS. LSA also identifies supportability issues during prototype studies.

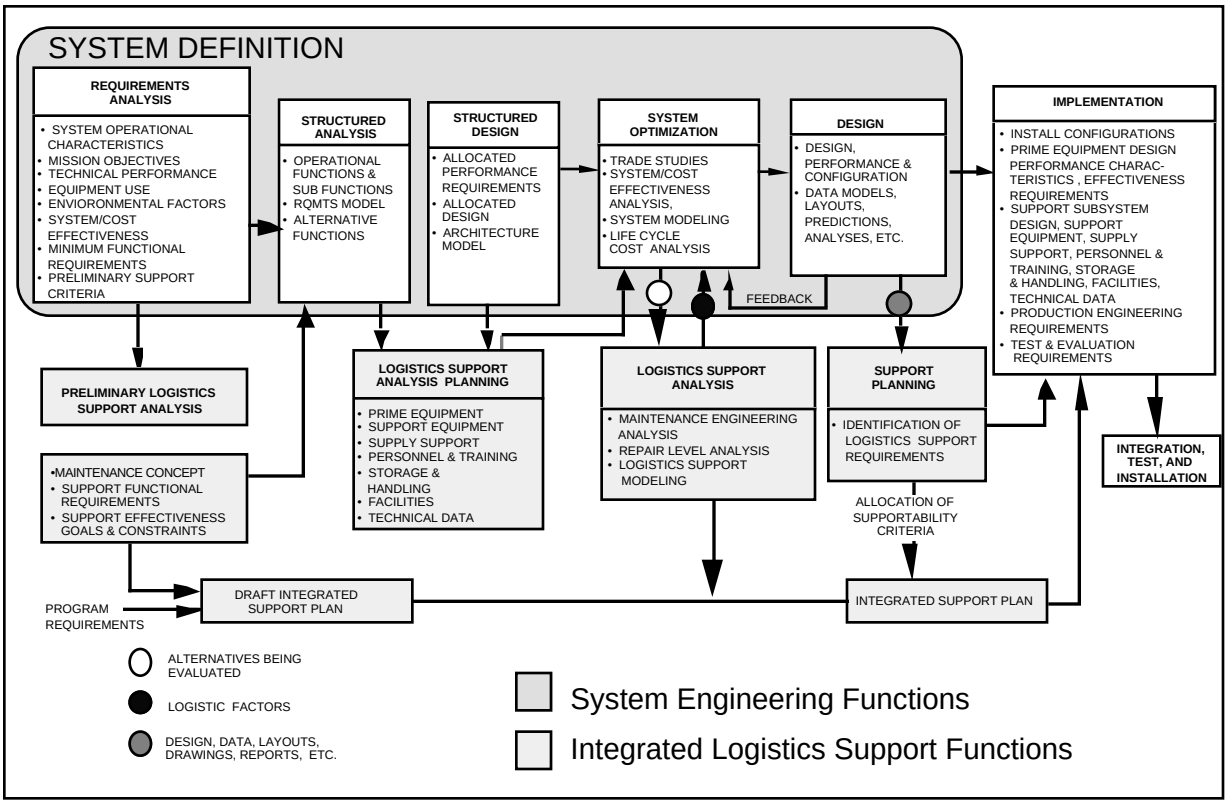

Figure 4-2. LSA Interfaces with System Engineering

Table 4-1, "LSA Task Relationships to ECS Deliverables," identifies the interactions between contract deliverables and the use of these deliverables in LSA tasks.

Table 4-1. LSA Task Relationships to ECS Deliverables

Contract Deliverables		LSA Tasks							
		202	205	301	302	303	401	403	501
Design/Supportability	**DID**								
Tradeoff Studies Analytical Data	211/SE3	•	•	•	•	•	•	•	•
Life Cycle Cost	213/SE2	•	•	•	•	•	•	•	•
ECS Rqmts Specifications	216/SE1	•	•						
Segment/Element Rqmts	304/DV1	•	•						
Segment/Element Design Specs	305/DV2	•	•	•	•	•			•
Maint and Ops Requirements	607/OP2	•	•	•				•	•
Prototyping and Studies Plan	317/DV1	•	•	•	•	•	•		•
Safety	NA	•	•		•	•	•	•	•
Human Factors	NA	•	•	•	•	•	•	•	•
Reliability									
Reliability Predictions	516/PA2	•	•	•	•	•	•	•	•
FMEA & Critical Items List	517/PA1	•	•	•	•	•	•	•	•
Standardization									
Configuration Management Plan	102/MG1	•	•	•	•	•	•	•	•
Procurement Management Plan	110/MG3	•	•	•	•	•	•	•	•
Testability									
Segment/Element Integ Test Plan	319/DV1	•	•	•	•	•	•		•
Special Maint. & Test Equipment	615/OP2	•	•				•	•	•
Test and Spt Equip Rqmts List	619/OP3	•	•	•			•	•	•
Maintainability									
Maintainability Demo. Plan	511/PA1	•	•	•	•	•	•		•
Maintainability Demo. Test Plan	512/PA1	•	•	•	•	•	•		•
Maintainability Predictions	518/PA3	•	•	•	•	•	•	•	•
Maint. and Ops. Mgt Plan	601/OP1	•	•	•	•		•	•	
Maint. and Ops. Procedures	609/OP1	•	•	•	•	•	•	•	•
Maintenance Plan	613/OP1	•	•	•	•	•	•	•	•
List of Recom'd Maint. Equip.	620/OP2	•	•	•			•	•	•
PHS&T	NA	•	•		•	•			
Technical Publications									
Operators Manuals	611/OP3	•		•	•			•	•
Standard Repair Procedures	526/PA1	•	•	•	•	•	•		
COTS Repair Manuals	NA	•	•	•	•	•	•	•	•
Spares/Property									
Property Management Plan	602/OP1		•	•					
Repl and spare Parts Lists	618/OP3	•	•	•	•		•	•	•
Training/Certification									
ECS Training Plan	622/OP2	•	•	•	•	•	•		•
Training Material	625/OP3	•	•	•	•	•	•		•
Certification Plan	626/OP1	•	•	•	•	•	•		•
Facilities									
ECS Facilities Plan	302/DV1	•	•			•		•	•

Outputs of the LSA program will be used to support RMA predictions and life-cycle-cost analyses. To avoid redundancy of effort, the R&M predictions derived during RMA modeling (and their related assumptions) and results of the failure modes and effects analysis (FMEA) will be used to support the LSA in the following activities:

a. Determining spare and repair parts provisioning levels

b. Identifying staffing and training requirements

c. Determining maintenance and support equipment requirements

Most of the reliability and maintainability (R&M) data will be obtained from the original equipment manufacturers (OEMs) and equipment vendors. If the vendor/OEM-provided R&M data is not provided, or is not credible, the procedures described in MIL-HDBK-217F, "Reliability Prediction of Electronic Equipment," MIL-HDBK 472, "Maintainability Prediction," or historical data for the same or similar equipment will be used.

LSA interfaces with the Quality Office through the non conformance reporting and corrective action process. During ECS operations non conformance reports are monitored to assess whether operations are adequately supported by the logistics infrastructure and processes. When necessary, corrective action is taken through resource or process changes to ensure the ECS is supported effectively and at the least cost to the Government. Further, actual performance data regarding the reliability and maintainability of ECS equipment is gathered to determine if previous predictions were accurate. When conclusive historical data warrants changes to the LSA data base, the data is updated for use in revising logistics plans, resources, and processes.

4.3.2 External Interfaces

The ILS office provides an interface with NASA's ECS Project Office through the ILS Management Team (ILSMT) and meetings with the Code 530 Logistics Management Section. The ILSMT is the principal interface with the ECS LSA program and provides direction over its execution. The ILS Manager is a member of the ILSMT and supports that organization based on priorities established by the ILSMT chairman. The ILS Office also establishes interfaces with ECS equipment providers, as needed, to support LSA requirements for price, performance, and support data related to COTS equipment.

4.4 LSA Approach

Logistics support analyses will be conducted to achieve the following;

a. Identify the logistics support resources necessary to support the Release B design,

b. Assemble the data and perform analysis necessary to develop the Release B Integrated Support Plan (CDRD 122), and

c. Influence the Release B design to the extent necessary to ensure that the ECS is logistically supportable and can achieve its performance objectives at the least life cycle cost.

To achieve these objectives, the acquisition of data relevant to logistics support analysis and planning must be completed in sufficient time to influence the design and to provide the foundation for logistics support planning.

4.4.1 Logistics Data Acquisition

The preliminary activities of logistics data acquisition are: developing a thorough understanding of the systems design and operations concept, and acquiring and maintaining logistics data related to that design. Logistics data acquisition and support analyses must be completed by February '96 to provide the foundation for support planning and preparation of the Integrated Support Plan, scheduled for delivery in April '96.

The operations concept and the Release B logical design are scheduled for completion at Release B IDR. These engineering products are reviewed to identify the following:

a. Equipment and SW comprising the design,

b. Operations scenarios and schedules,

c. Operations positions to be supported,

d. Other support requirements and resource constraints

Until specific make/model equipment is selected for the detailed design, due at Critical Design Review (CDR), support analysis of logical design equipment and its operational characteristics and support requirements will be based upon the products procured for Release A. Much of the logistics data related to these products were solicited earlier from OEMs through requests for information to support product selection. The data acquisition task includes obtaining missing data from the OEMs and entering it into the logistics database. Emphasis will be on equipment support characteristics and requirements having the greatest cost and performance impacts on Release B operations and logistics support. Specifically, this includes science processors, workstations, servers, data storage equipment, and communications equipment.

4.4.2 Logistics Database

LSA data is being maintained using a DOS-based system until a UNIX/Sybase system is available to support a common LSA database, which is currently planned for early '96. The LSA database is used for supportability and related analyses (e.g. RMA and LCC). Establishment and maintenance of the database is the responsibility of the ILS Office. The logistics database is the central repository of logistics information used in support analyses, logistics planning, determining requirements for spares and repair parts, and assessing logistics cost drivers. It includes the following:

a. OEM-predicted inherent reliability and maintainability data for the equipment and component line replaceable units (LRUs), expressed as mean time between failure (MTBF) and mean time to repair (MTTR) respectively,

b. Sources, prices, descriptions, useful life, and reparability of repair parts, test and support equipment, and diagnostics equipment/SW,

c. Maintenance training requirements and related costs,

d. Preventive maintenance requirements,

e. Availability of OEM technical documentation required to support the equipment,

f. OEM-recommended spares/repair parts, tools, test and diagnostics equipment and software, and support equipment,

g. Physical equipment characteristics needed for packaging, handling, storage, and transportation (PHS&T) planning

Actual performance data regarding the reliability and maintainability of ECS equipment, LRUs provisioned and used, and related logistics data is gathered during operations to provide historical data for future planning. When conclusive historical data warrants changes to the LSA data base, the historical data is used in revising logistics plans, resources, and processes.

4.4.3 Support Analyses

Logistics support analyses support the logistics planning effort and the preparation of the following plans:

a. Integrated Support Plan,

b. COTS Maintenance Plan,

c. ECS Training Plan,

d. ECS Facilities Plan,

e. Other CDRD documents required at Release B CDR

Support analyses and the resultant plans will provide the foundation on which the logistics program is based. These analyses are described below.

4.4.3.1 Maintenance

Using the information gathered from the operations concept, systems design, and OEM product data, the maintenance analysis assesses the resources required to support the design. This maintenance analysis considers the following:

a. System, segment, and function availability and mean down time (MDT) requirements

b. Level of repair analysis (LORA) for equipment to be supported,

c. Equipment maintainability, including availability of equipment/SW diagnostics tools and requirements for support equipment

d. Preventive maintenance and calibration requirements

e. Availability and relative costs of maintenance providers

f. Repair parts requirements, costs, sources, and repair/replacement time and costs

g. Maintenance skills and training requirements

The maintenance analysis will determine the maintenance and spares provisioning concept, identify equipment/SW diagnostics requirements, and support the selection of maintenance providers. Because equipment and SW maintenance represents a substantial part of the overall system life cycle costs and of its effect on the achievement of the system availability and MDT objectives, maintenance analysis is one of the principal focuses of the LSA program. Plans for demonstrating the maintainability of ECS equipment are addressed in the Maintainability Demonstration Plan (CDRL 084) and in Maintainability Demonstration Test Plans (CDRL 085). The maintenance analysis also determines whether there are requirements for specialized test or support equipment. It is expected that there will be no such requirement because of the use of commercial-off-the-shelf equipment in the design. If such requirements are discovered, they will be identified in CDRD 121, Special Maintenance & Test Equipment Requirements.

4.4.3.2 Equipment Standardization

ECS designs and equipment selections will be analyzed to determine whether standardization has received adequate consideration. ECS is planned to be an open, heterogeneous system comprised of workstations, servers, and communications equipment from a variety of manufacturers. Such an architecture limits opportunities to standardize equipment and thereby minimize support costs. However, the support analysis will assess opportunities for standardizing components across platforms (e.g. use of common hard disks and tape drives in workstations), the use of common support equipment, and equipment standardization at each site. The ILS Office participates in design reviews and product selection to influence decisions toward standardization when performance, costs, and supportability can be optimized by doing so.

4.4.3.3 Facilities

An analysis of facilities available versus facilities required to satisfy ECS operations and logistics support has been ongoing since contract start up. Projections are based on the power, environment, dimensions and weight, and space requirements of the baseline ECS architecture at contract award. These requirements are documented in the ECS Facilities Plans (CDRD 043). Facility requirements for Release B equipment and operations and any additional requirements identified during the support analysis will be incorporated in the next update to the Facilities Plans due at the CDR in April ‘95.

4.4.3.4 Consumables and Repair Parts

Needs for consumables are identified to determine the types of consumables required, projected consumption rates, available sources and costs, shelf life, and to identify opportunities for standardization. Such information is used in planning replenishment, storage requirements, and determining sources and costs. Projections of consumables requirements will be provided to the Government for use in its acquisition planning and budgeting.

Repair parts requirements are identified during the maintenance analysis and used to project sparing, replenishment, and storage requirements. Alternative sources for repair parts are identified to ensure their availability and to competitively procure them when possible, and thereby minimize support costs. This information is provided at CDR in the Replacement Part List and Spare Parts List (CDRD 124). While OEM-recommendations for provisioning repair parts at the

sites are considered, the mix and quantities to be provisioned at the sites will be based on all factors, including the following: failure rates, criticality, component redundancy, costs, replenishment time, and function availability and MDT requirements.

4.4.3.5 Configuration Management

Managing COTS configuration changes will be a challenge to logistics support operations. OEMs use varying means to disseminate information regarding product configuration changes. Some announce changes to the customer in advance (push), others require the customer to inquire about changes (pull), and some disseminate the change without prior notification (e.g. SW). The support analysis will determine how OEM changes are disseminated, which will then be used to develop a process for managing product configuration changes. This process is described in the Integrated Support Plan (CDRL 122).

4.4.3.6 Supportability Testing

Release B equipment will be COTS and will have been evaluated as during Release A operations. Supportability testing may be performed on COTS equipment that requires logistics support resources above those currently planned for the sites. OEMs will be asked to identify test equipment required to support their products. Test and support equipment selected will have common or universal application, whenever possible. Single application test equipment will held to a minimum. These requirements will be documented in the Test and Support Equipment Requirements List (CDRL 125) to be delivered at CDR.

4.4.3.7 Technical Documentation

Requirements for COTS technical documentation are identified to ensure operators and support personnel have available the technical references needed to perform their functions. OEM documentation is reviewed to determine adequacy of its content. Specifically, OEM documentation is reviewed to ensure it provides the range of information required by operators and support personnel; that the M&O procedures are clear, accurate, and complete; and that maintenance documents identity parts and LRU information. Technical documents are also reviewed to identify skills and training required of maintenance personnel and to assess equipment test and diagnostic procedures. The support analysis will identify technical documentation not included in the price of the equipment or SW, determine site needs for such documentation, and the type of media in which it is to be provided (i.e., paper, CD-ROM, disk). OEM and contractor-developed technical documentation is validated as part of the design reviews.

4.4.3.8 Training

ECS training requirements are identified as a byproduct of the repair level analyses and after identification of the site M&O staffing requirements. Training costs will be factored into the support costs used in tradeoff analyses conducted for alternative ECS designs. Training requirements are used to develop the training program, course curricula, and schedules, which are documented in the ECS Training Plan (CDRD 128).

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5. LSA Schedule

5.1 LSA Program Schedule - Release B

LSA analyses are constrained by the limited time available between the PDR and CDR for Release B and the delivery dates required for output products of the analyses (i.e., ECS CDRD deliverables). Accordingly, the schedule shown in Figure 5-1, "LSA Program Schedule," reflects these constraints. Logistics support analyses, as an iterative process, will continue beyond CDR, as necessary, to obtain any missing support data needed to refine the logistics support approaches presented in the ECS plans.

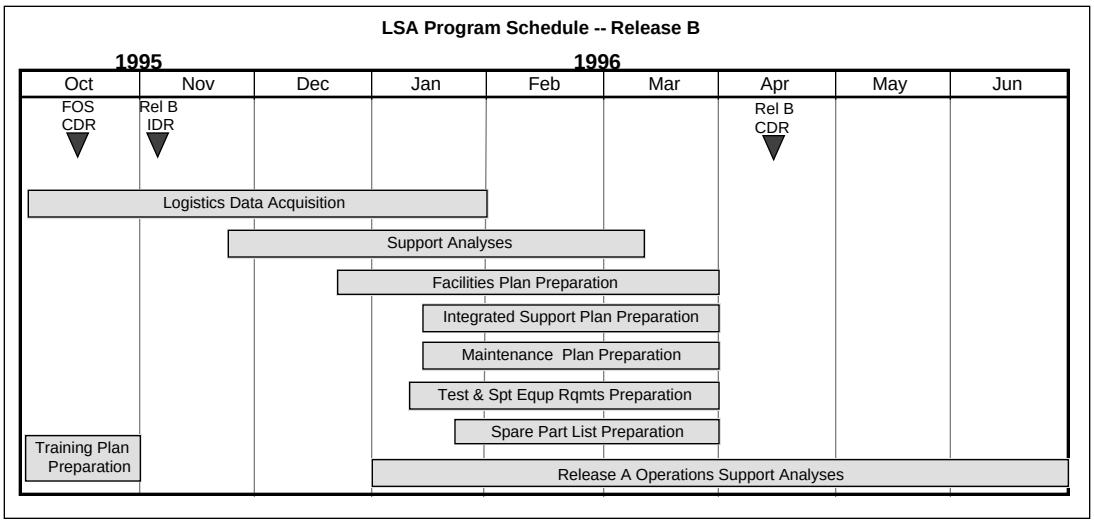

Figure 5-1. LSA Program Schedule

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Abbreviations and Acronyms

A_o	Operational Availability
ASF	Alaska SAR Facility
CDR	Critical Design Review
CDRD	Contract Data Requirements Document
COTS	Commercial Off-The-Shelf
CSMS	Communications and Systems Management Segment
DAAC	Distributed Active Archive Center
ECS	EOSDIS Core System
EDF	EOS Development Facility
EDC	EROS Data Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EROS	Earth Resources Observation System
FMEA	Failure Mode and Effects Analysis
FOS	Flight Operations Segment
GFE	Government-Furnished Equipment
GFSC	Goddard Space Flight Center
IDR	Increment Design Review
ILS	Integrated Logistics Support
ILSO	Integrated Logistics Support Office
ILSMT	Integrated Logistics Support Management Team
ISP	Integrated Support Plan
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
LCC	Life Cycle Cost
LORA	Level of Repair Analysis
LRU	Line Replaceable Unit
LSA	Logistics Support Analysis

M&O	Maintenance and Operations
MDT	Mean Down Time
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
NSIDC	National Snow and Ice Data Center
M&O	Maintenance and Operations
OEM	Original Equipment Manufacturer
PDR	Preliminary Design Review
PHS&T	Packaging, Handling, Storage, and Transportation
PM	Preventive Maintenance
R&M	Reliability and Maintainability
RMA	Reliability, Maintainability, Availability
RPL	Replacement Parts List
RRR	Release Readiness Review
SCDO	Science and Communications Development Office
SDPS	Science Data Processing Segment
SDR	System Design Review
SMO	System Management Office
SOW	Statement of Work